

Claims

- [c1] 1.A system for quantifying baseline model quality, comprising:
- an engine service database containing engine data;
 - a preprocessor for processing the engine data into a predetermined format, wherein the preprocessor includes a data segmenting component that segments the engine data into a plurality of groups based upon specific engines and further based upon specific time periods during which each data element was measured; and
 - an engine baseline modeling component that builds an engine baseline model for each of the plurality of groups using a regression analysis, wherein the regression analysis relates engine performance variables as a function of engine operating conditions.
- [c2] 2.The system of claim 1, wherein the segmenting component segments the engine data into a plurality of groups throughout a preselected time moving window.
- [c3] 3.The system of claim 1, wherein the segmenting component segments the engine data into a plurality of groups throughout discrete time ranges.

- [c4] 4.The system of claim 1, wherein the engine baseline modeling component generates a set of estimated regression parameters for each of the plurality of groups based upon the regression analysis, wherein each set of estimated regression parameters are representative of a baseline model for each group.
- [c5] 5.The system of claim 4, wherein the engine baseline modeling component calculates a time series for each estimated regression parameter, and wherein the engine baseline modeling component further calculates a trend for each estimated regression parameter over time.
- [c6] 6.The system of claim 4, further comprising:
means for identifying fluctuations in trends for each estimated regression parameter representative of engine faults;
means for evaluating trends having identified fluctuations; and
means for identifying parameter estimate trends relating to baseline trend shifts.
- [c7] 7.The system of claim 6, wherein the preprocessor maps engine data to an uncorrelated data set using a principal component analysis technique.
- [c8] 8.The system of claim 1, wherein the preprocessor com-

prises a data acquisition component that extract engine data from the engine services database.

- [c9] 9.The system of claim 1, wherein the engine baseline modeling component comprises a metric component that validates the engine baseline model.
- [c10] 10.The system of claim 1, wherein the engine baseline modeling component comprises a heuristics component that generates rules for cleaning the preprocessed data.
- [c11] 11.The system of claim 1, further comprising a model diagnostics component that evaluates performance of the engine baseline model.
- [c12] 12.A method for quantifying baseline model quality, comprising:
 - storing engine data in an engine service database;
 - processing the engine data into a predetermined format in a preprocessor, wherein the processing includes a segmenting the engine data into a plurality of groups based upon specific engines and further based upon specific time periods during which each data element was measured;
 - building an engine baseline model for each of the plurality of groups using a regression analysis, wherein the regression analysis relates engine performance variables

as a function of engine operating conditions.

- [c13] 13.The method of claim 12, further comprising segmenting the engine data into a plurality of groups throughout a preselected time moving window.
- [c14] 14.The method of claim 12, further comprising segmenting the engine data into a plurality of groups throughout discrete time ranges.
- [c15] 15.The method of claim 12, further comprising generating a set of estimated regression parameters for each of the plurality of groups based upon the regression analysis, wherein each set of estimated regression parameters are representative of a baseline model for each group.
- [c16] 16.The method of claim 15, further comprising:
calculating a time series for each estimated regression parameter; and
calculating a trend for each estimated regression parameter over time.
- [c17] 17.The method of claim 15, further comprising:
identifying fluctuations in trends for each estimated regression parameter representative of engine faults;
evaluating trends having identified fluctuations; and
identifying parameter estimate trends relating to baseline trend shifts.

- [c18] 18. The method of claim 17, further comprising mapping engine data to an uncorrelated data set using a principal component analysis technique.
- [c19] 19. The method of claim 12, wherein the processing step further comprising extracting engine data from the engine services database.
- [c20] 20. The method of claim 12, further comprising validating the engine baseline model.
- [c21] 21. The method of claim 12, further comprising generating rules for cleaning the preprocessed data.
- [c22] 22. The method of claim 12, further comprising evaluating performance of the engine baseline model.
- [c23] 23. A computer-readable medium incorporating instructions for quantifying baseline model quality, comprising:
 - one or more instructions for storing engine data in an engine service database;
 - one or more instructions for processing the engine data into a predetermined format in a preprocessor, wherein the one or more instructions for processing includes one or more instructions for segmenting the engine data into a plurality of groups based upon specific engines and further based upon specific time periods during which

each data element was measured;
one or more instructions for building an engine baseline model for each of the plurality of groups using a regression analysis, wherein the regression analysis relates engine performance variables as a function of engine operating conditions.

[c24] 24.The computer-readable medium of claim 23, further comprising one or more instructions for segmenting the engine data into a plurality of groups throughout a preselected time moving window.

[c25] 25.The computer-readable medium of claim 23, further comprising one or more instructions for segmenting the engine data into a plurality of groups throughout discrete time ranges.

[c26] 26.The computer-readable medium of claim 23, further comprising one or more instructions for generating a set of estimated regression parameters for each of the plurality of groups based upon the regression analysis, wherein each set of estimated regression parameters are representative of a baseline model for each group.

[c27] 27.The computer-readable medium of claim 25, further comprising:
one or more instructions for calculating a time series for

each estimated regression parameter; and
one or more instructions for calculating a trend for each
estimated regression parameter over time.

[c28] 28. The computer-readable medium of claim 26, further
comprising:

one or more instructions for identifying fluctuations in
trends for each estimated regression parameter repre-
sentative of engine faults;

one or more instructions for evaluating trends having
identified fluctuations; and

one or more instructions for identifying parameter esti-
mate trends relating to baseline trend shifts.

[c29] 29. The computer-readable medium of claim 28, further
comprising one or more instructions for mapping engine
data to an uncorrelated data set using a principal com-
ponent analysis technique.

[c30] 30. The computer-readable medium of claim 23, wherein
the one or more instructions for processing further com-
prise one or more instructions for extracting engine data
from the engine services database.

[c31] 31. The computer-readable medium of claim 23, further
comprising one or more instructions for validating the
engine baseline model.

- [c32] 32.The computer-readable medium of claim 23, further comprising one or more instructions for generating rules for cleaning the preprocessed data.
- [c33] 33.The computer-readable medium of claim 23, further comprising one or more instructions for evaluating performance of the engine baseline model.